State Water Resources Control Board Workshop 2
Bay-Delta Fishery Resources

October 1-2, 2012

California Department of Fish & Game

Workshop 2:Bay-Delta Fishery Resources Comprehensive (Phase 2) Review and Update to the Bay-Delta Plan

October 1, 2012

Kevin Shaffer and Pat Coulston

FISH SPECIES ARE AT RISK:
Listing Actions Since 2006

- Delta smelt (State and federally listed)
- Longfin smelt (State listed; Bay-Delta Distinct Population Segment warrants listing federally)
- Green sturgeon (federally listed)
- Spring-run Chinook salmon (State and federally listed)
- Winter-run Chinook salmon (State and federally listed)
- Central Valley steelhead (federally listed)
- Fall and late-fall run Chinook salmon
- White surgeon

KEY POINTS – CENTRAL VALLEY SALMONIDS

- Salmon Narrative Objective:
  - Several actions and monitoring implemented since 2006
  - Population doubling goals still not being met
- DCC Gate Operation Objective
  - Adopt NMFS criteria with DFG participation in decision-making
- Upstream flow management issues
- Adaptive management/climate change

Salmonid Plans/Programs Implemented Since 2006

- CV Constant Fractional Marking Program
  - Provides annual evaluation of hatchery-origin Chinook salon returning to Central Valley
- CV Chinook Salmon Escapement and Steelhead Monitoring Plans
  - Provides specific, regional, and Central Valley data on both Chinook salmon and steelhead populations in the Central Valley
- CA Hatchery Scientific Review Group Report
  - Provides scientific recommendations for improving integrity of Central Valley programs and reducing interactions and impacts to naturally spawning populations
- NMFS CV Recovery Plan
  - Implementation of actions will be the foundation for recovering steelhead and both listed stocks of Chinook salmon to sustainable, naturally producing populations.

Salmon Narrative Goal Still Not Being Met: Fall-run Chinook Salmon

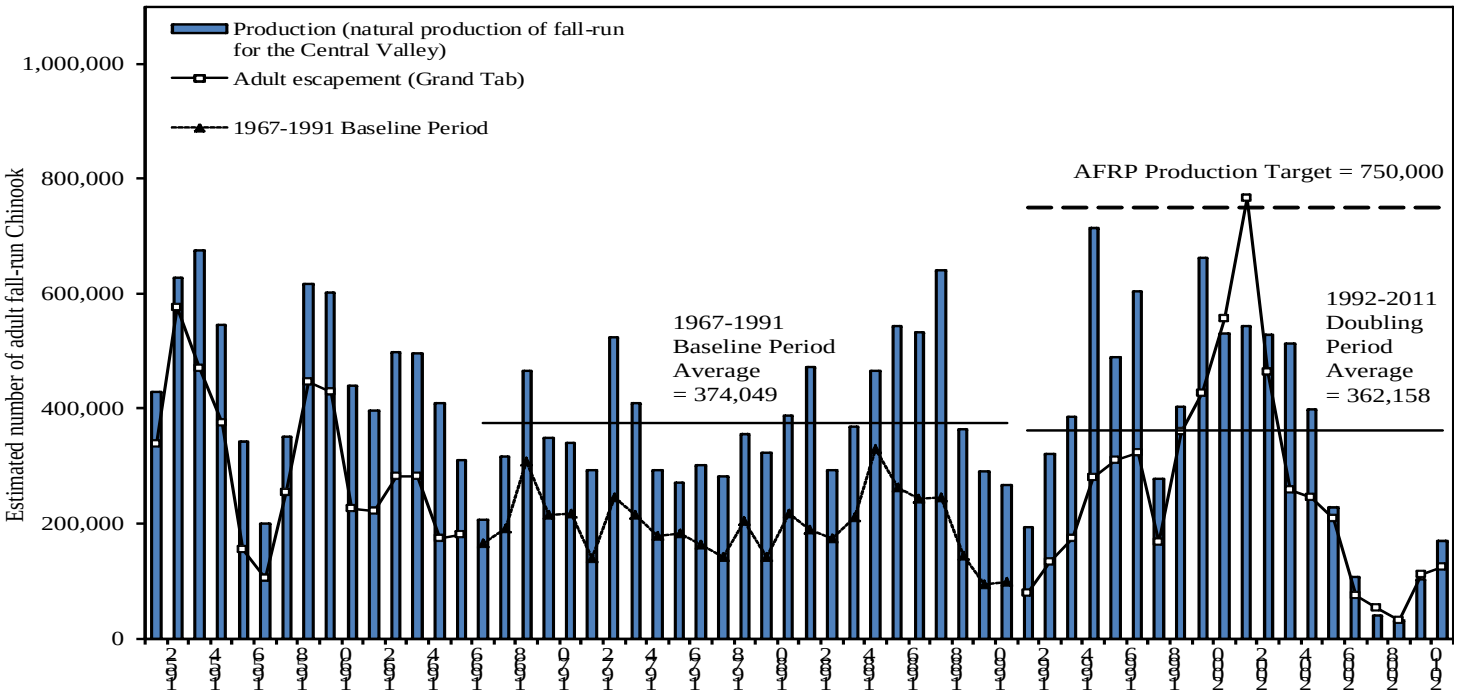


Figure 1. Estimated yearly natural production and in-river escapement of adult fall-run Chinook salmon in the Central Valley rivers and streams. 1952 - 1966 and 1992 - 2011 numbers are from CDFG Grand Tab (Apr 24, 2012). 1967-1991 Baseline Period numbers are from Mills and Fisher (CDFG, 1994).

Endangered Winter-run Chinook Salmon

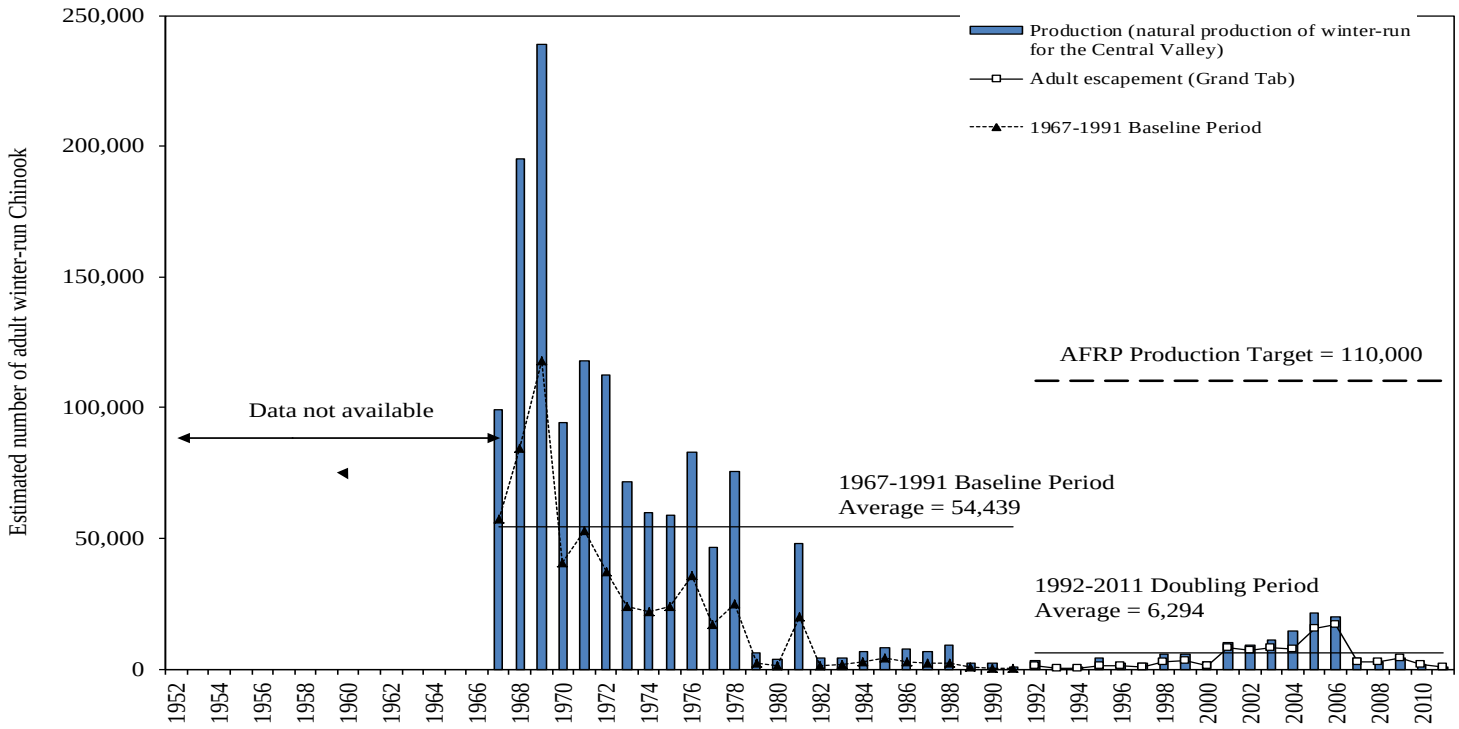


Figure 3. Estimated yearly adult natural production, and in river adult escapements of winter-run Chinook salmon in the Central Valley rivers and streams. 1992 - 2011 numbers are from CDFG Grand Tab (Apr 24, 2012). 1967-1991 Baseline Period numbers are from Mills and Fisher (CDFG, 1994).

Delta Cross Channel Gate Operations

- Recommend amending the WQCP criteria with current operating criteria in the NMFS OCAP Biological Opinion (2009, 2011)

- In addition, add criteria for optional gate closures in October to allow pulse flow experiment in lower Mokelumne River

Upstream Flow Management Issues for Salmonid Protection

- Redd dewatering
- Restoration of floodplain habitat
- Riparian processes and regeneration

Redd dewatering in winter 2012

Sacramento River below Keswick Dam

Central Valley sturgeon

- Sturgeon are of important anadromous ecological and angling values in the Central Valley and Delta
- Due to indices of recruitment, water management should take a precautionary approach
- DFG is putting emphasis in regulations and monitoring to protect both species
- Remediating stranding and migration barriers as well as improving upstream spawning grounds are priorities.
- DFG is a member of the federal recovery team for green sturgeon

WHAT'S NEXT

Adaptive Management

- Why (complex system)
- Continued need for monitoring and special studies, timely reporting of data

Climate Change

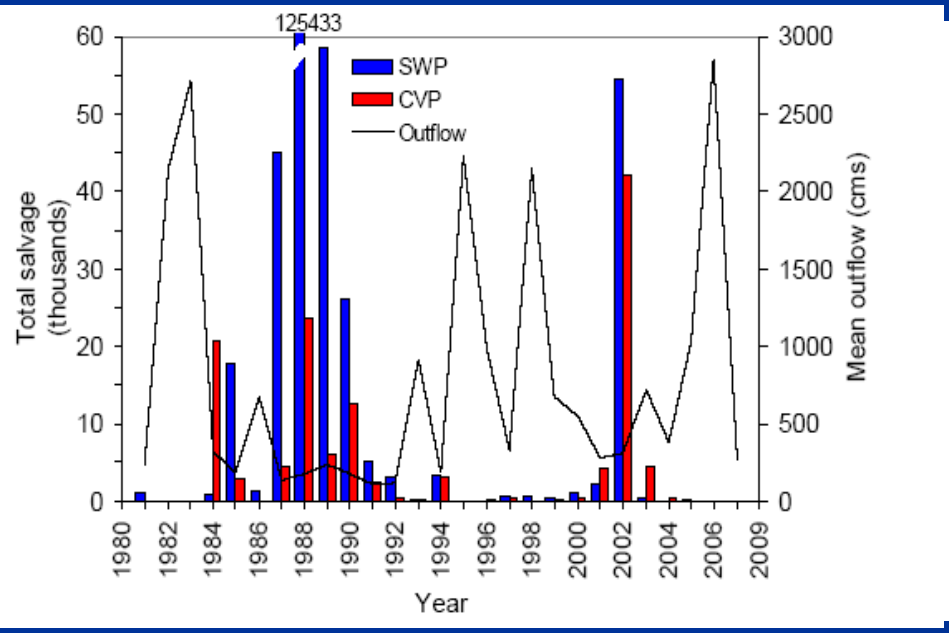
- Temperature challenges
- Changes in habitat suitability

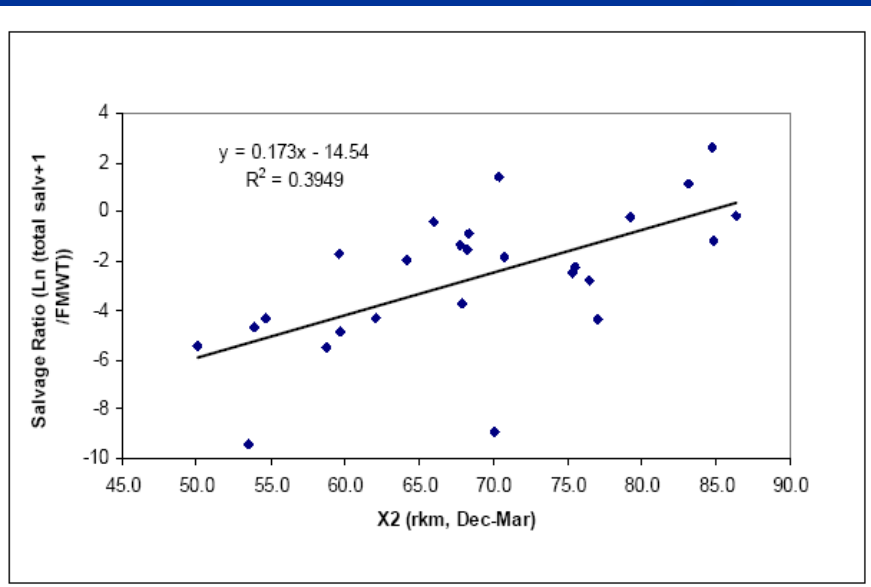
Smelt Entrainment Impacts/Protection: Key Points

- Both Species have substantial vulnerabilities

LFS SMELT ENTRAINMENT

- Primarily adult spawners,larvae, early juveniles
- Primarily in drier years
- “Kicking them while they are down”



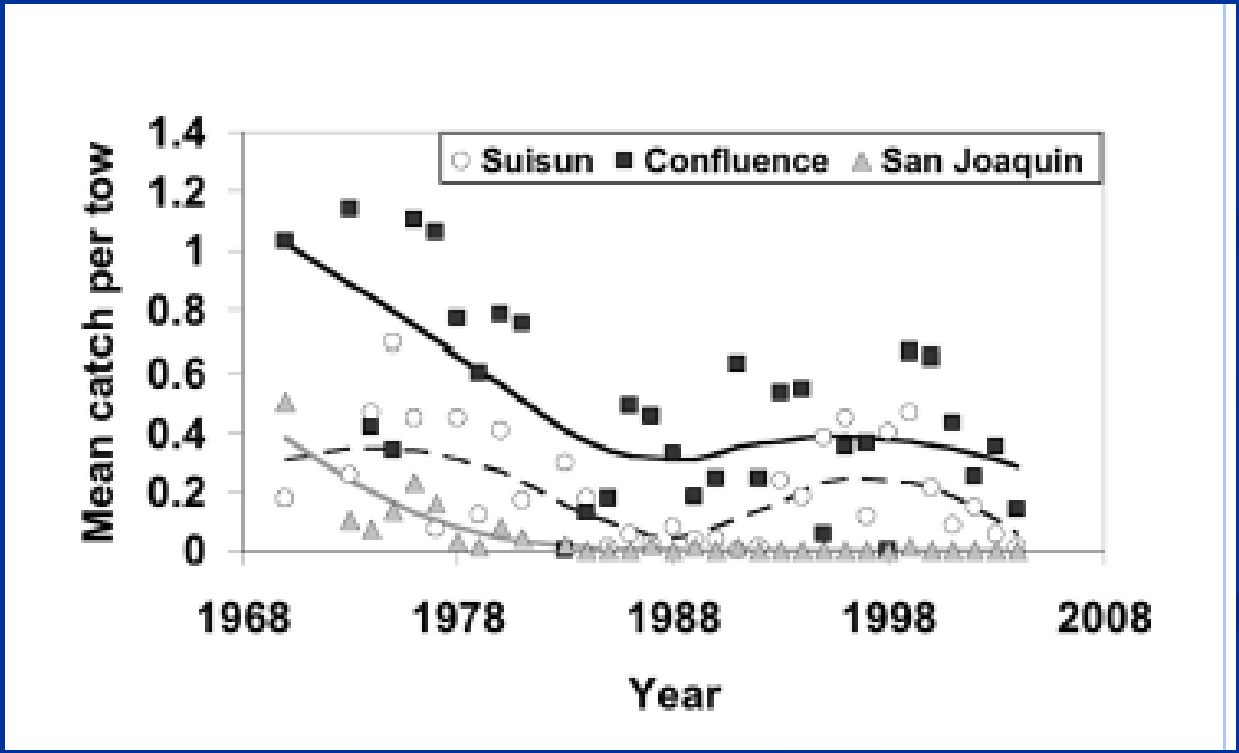


Delta Smelt Entrainment

- Spawning adults,larvae, and juveniles
- Greater vulnerability in drier winter/spring
- Kimmerer/Miller estimates

Smelt Entrainment is Under-observed

- Potentially high levels of pre-screen loss
- Unmeasured larval entrainment
- Distorted by historical impacts?



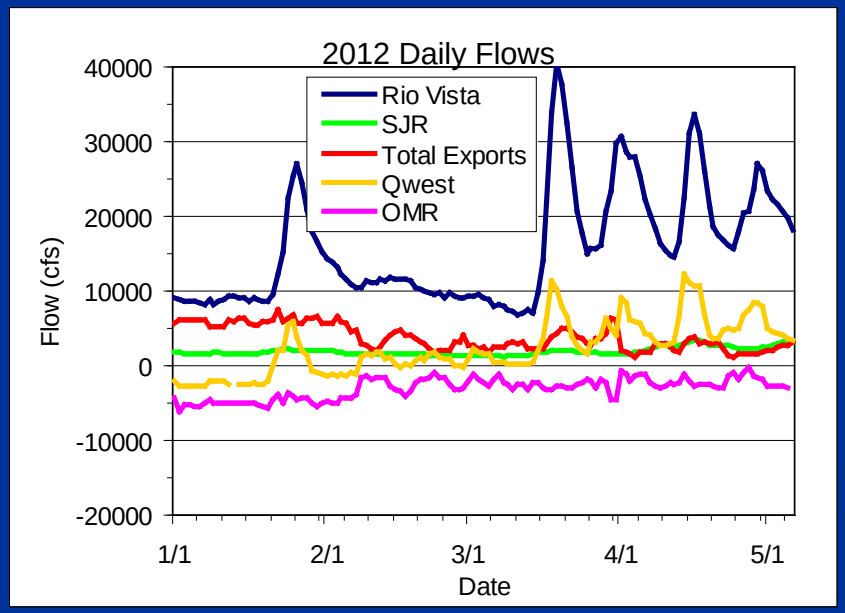
Current SWRCB Protection Insufficient

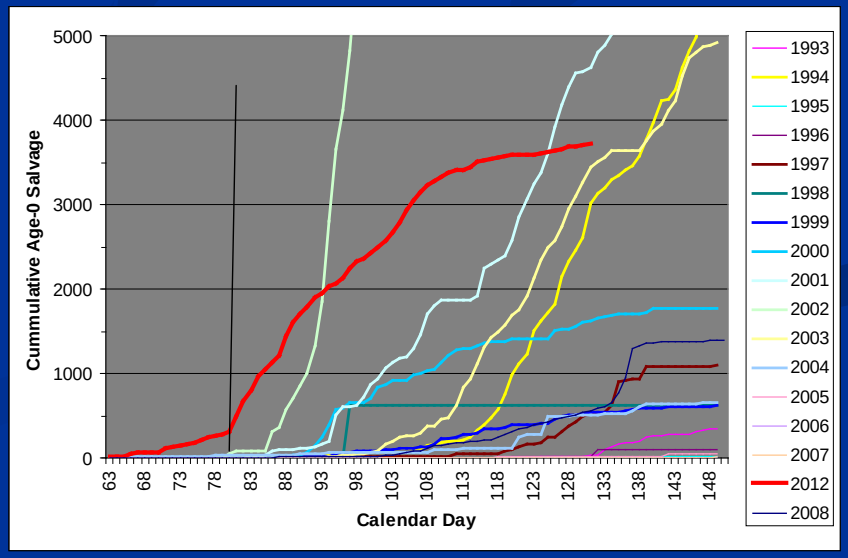
- Current protection under 2006 B-D Plan
- Seasonal need for protection

Unmet protective needs
•OMR
•Full Season protection

Full Season Protection: 2012 LFS Case

"Modestly negative OMR in January, less negative OMR in February and thereafter (Figure 7) were believed to have reduced entrainment from the San Joaquin River into the south Delta and increased transit times to the fish facilities sufficiently to allow a much greater proportion of larvae to grow to 20 mm juveniles and be observed in salvage relative to years past (Figure 1)."





Existing Protection Schemes

- DFG ITP:
- USFWS Delta Smelt BO:
- DFG Flow Criteria Report:
- OMR! & X2

Population Importance of entrainment

- 2012 delayed ent. experience
- Early 1970s situation.
- Variable results from (LFS wide distribution, highly variable response to flow, hard to find irregular impact in this situation)
- “no DD, then entrainment is important
- They are listed, so…

DFG summary

- Water flow management in the Delta should focus on key migration, spawning, and rearing functions of all fish species.
- Adjusted Delta cross-channel gate operations will benefit anadromous species
- Several monitoring programs are underway to gather information to advise and revise water management
- Upstream water management will be key to conserving anadromous species.
- Climate change posing challenges to aquatic species and ecosystems- the delta; Sacramento River basin

SWRCB Salmonids and Pelagic Organisms workshop

Pat Brandes and Roger Guinee

U.S. Fish and Wildlife Service

October 1, 2012

Outline

- What additional scientific information should be considered to inform potential changes to the Bay-Delta plan?

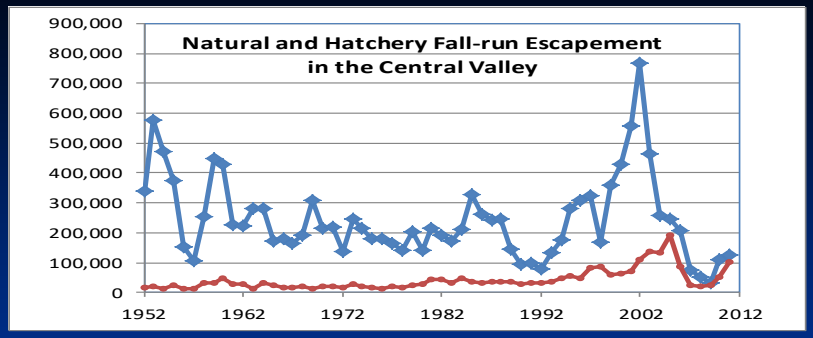
- How should the State Board address scientific uncertainty and changing circumstances?

* Key Points from previous submittals

Key points

The Board should consider UPDATED information on:

1. the status of the stocks (escapement and adult production, and relative contribution by hatchery stocks)



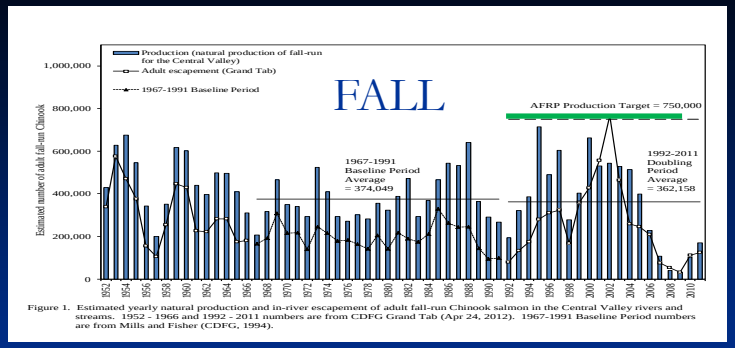


Figure 1. Estimated yearly natural production and in-river escapement of adult fall-run Chinook salmon in the Central Valley rivers and streams. 1952 - 1966 and 1992 - 2011 numbers are from CDFG Grand Tab (Apr 24, 2012). 1967-1991 Baseline Period numbers are from Mills and Fisher (CDFG, 1994).

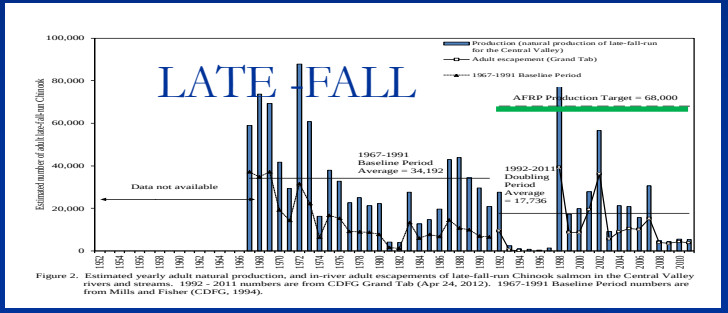


Figure 2. Estimated yearly adult natural production, and in-river adult escapements of late-fall-run Chinook salmon in the Central Valley rivers and streams. 1992 - 2011 numbers are from CDFG Grand Tab (Apr 24, 2012). 1967-1991 Baseline Period numbers are from Mills and Fisher (CDFG, 1994).

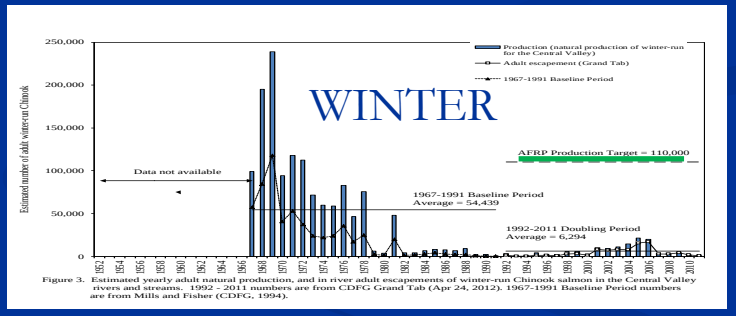


Figure 3. Estimated yearly adult natural production, and in river adult escapements of winter-run Chinook salmon in the Central Valley rivers and streams. 1992 - 2011 numbers are from CDFG Grand Tab (Apr 24, 2012). 1967-1991 Baseline Period numbers are from Mills and Fisher (CDFG, 1994).

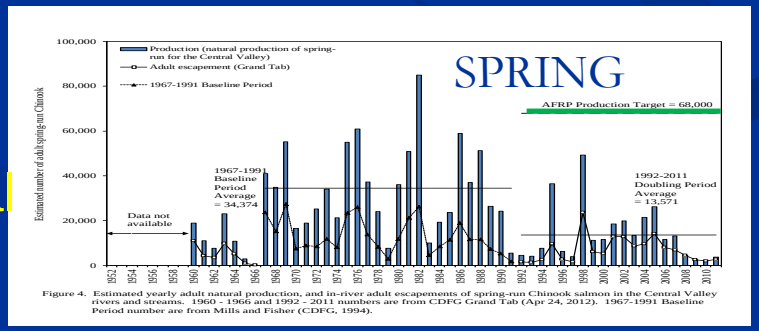


Figure 4. Estimated yearly adult natural production, and in-river adult escapements of spring-run Chinook salmon in the Central Valley rivers and streams. 1960 - 1966 and 1992 - 2011 numbers are from CDFG Grand Tab (Apr 24, 2012). 1967-1991 Baseline Period number are from Mills and Fisher (CDFG, 1994).

Indicators demonstrate continued decline of CV salmonid populations

More protection is needed to meet the salmon narrative WQCP goal and CVPIA's AFRP doubling goal.

*Changes in Delta flows and flow variability have contributed to declines of multiple native species, including salmonids (DOI, 2010)

* The fundamental components of the natural flow regime, have been substantially altered by human activity (DOI, 2010).

Key points

The Board should consider UPDATED information on:

1. the status of the stocks (escapement and adult production, and relative contribution by hatchery stocks)
2. juvenile salmon indices at Chipps Island relative to flow

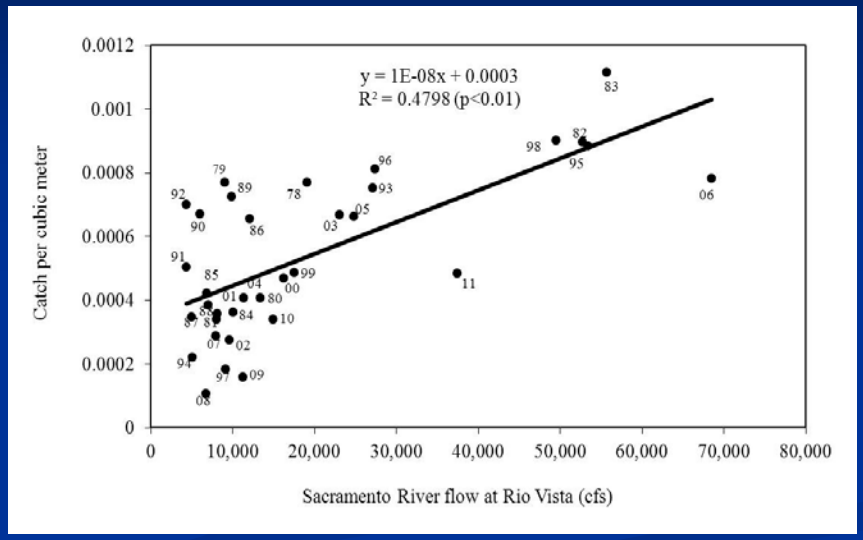
Juvenile salmon production leaving the Delta is higher at higher flows

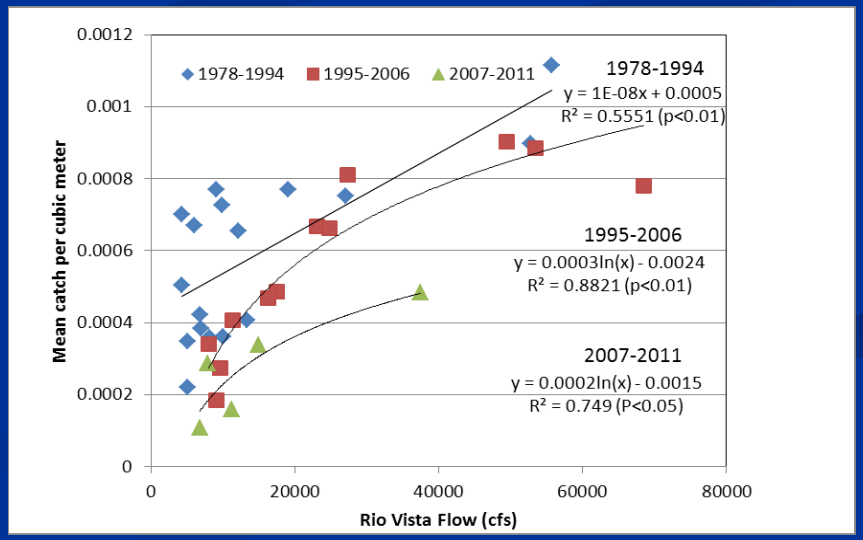
* Flow is one of the most important components of ecosystem function (DOI, 2012).

* Delta inflow and outflow are important for salmon migration cues and juvenile survival and abundance in the Delta (DOI, 2010).

* Mechanisms for increased survival at higher flows include:
  - reduced water temperature,
  - lower proportion of flow diverted,
  - reduced entrainment,
  - lower predation and disease,
  - elimination of reverse flows,
  - increased floodplain habitat

  (DOI,2010).





Source: FWS , unpublished data

Key points

The Board should also consider RECENT information on:

3. the temporal distribution of all runs of Chinook salmon in the Delta based on genetic analyses.

Key points

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3. the temporal distribution of all runs of Chinook salmon in the Delta based on genetic analyses

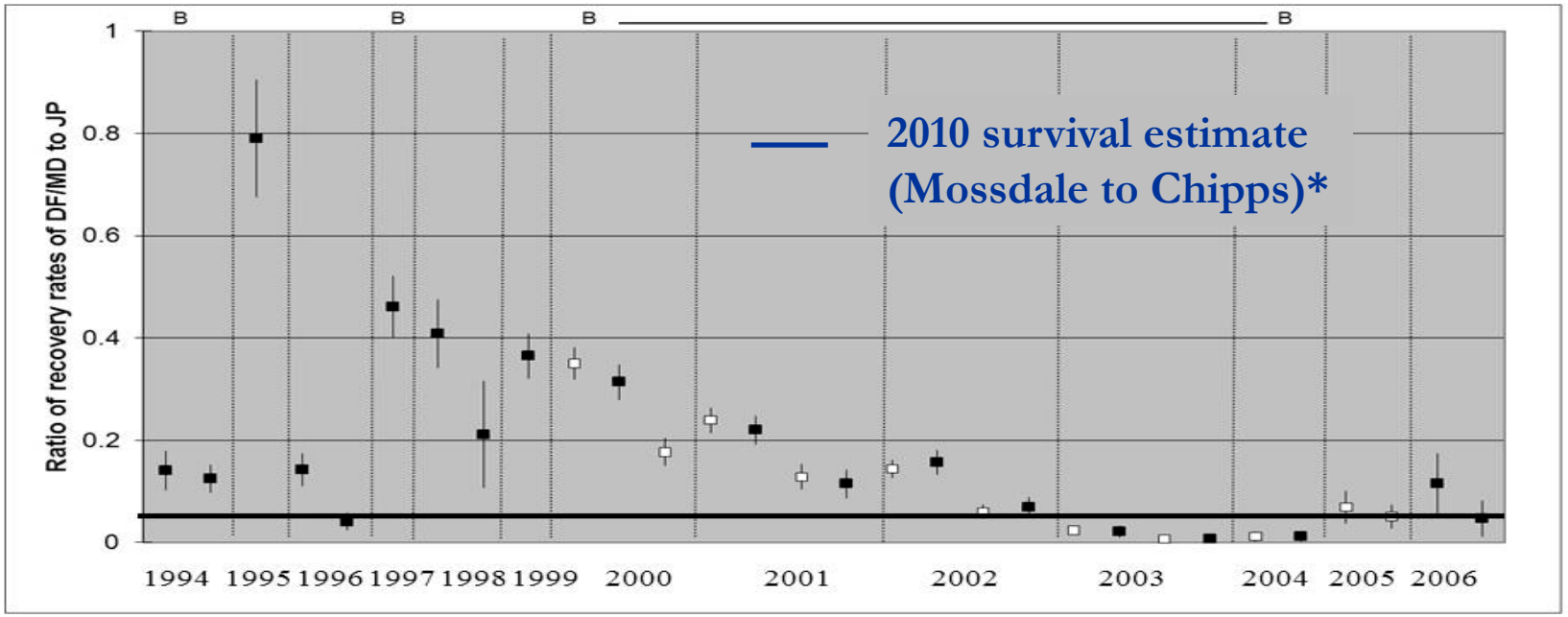
4. juvenile salmon survival estimates from the 2010 VAMP and 2012 Stanislaus studies

   (and 2011 and 2012 south Delta study results when available)

Juvenile salmon survival was low (0.05) in 2010

relative to many of the past years

Salmon smolt survival from Mossdale (black) or Durham Ferry (white) to Jersey Point



1994-2006 studies used coded wire tagged fish;
2010 study used acoustically tagged fish, removing predator like detections
*Additional mortality between Jersey Point and Chipps Island is assumed to be low.

B = Years with physical Head of Old River installed
Non-physical barrier installed in 2010.

Source Brandes et al., 2008. and SJRG, 2010

Key points

The Board should also consider new information on:

5. Increasing the duration of DCC gate closures *(and eliminating bidirectional tidal flows into Georgiana Slough) (DOI, 2010)

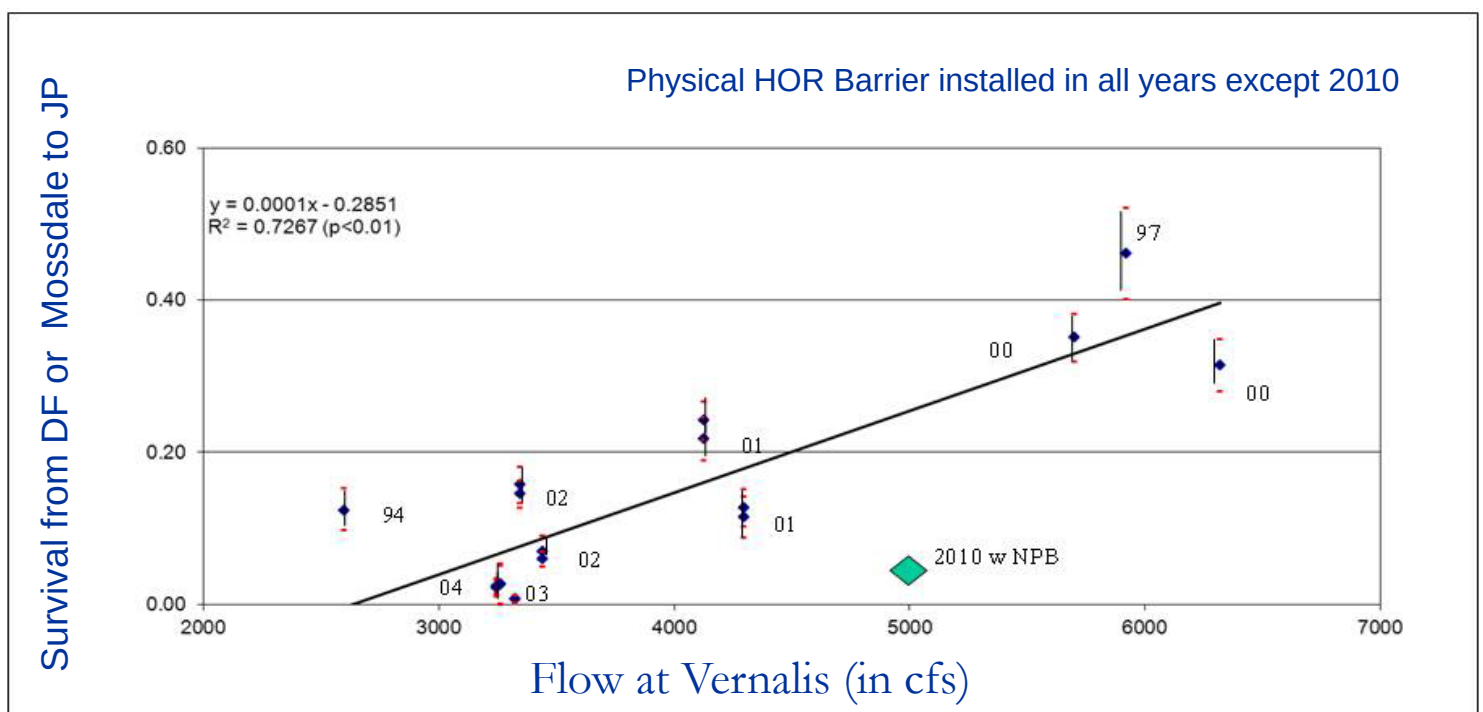
Key points

The Board should also consider information on:

5. Increasing the duration of DCC gate closures *(and eliminate bidirectional tidal flows into Georgiana Slough)

6. the benefits to salmon of flow with a physical barrier at the head of Old River – under hydrodynamic conditions still protective of delta smelt

Salmon survival with a physical HORB is related to flow and higher than when the non-physical barrier was installed



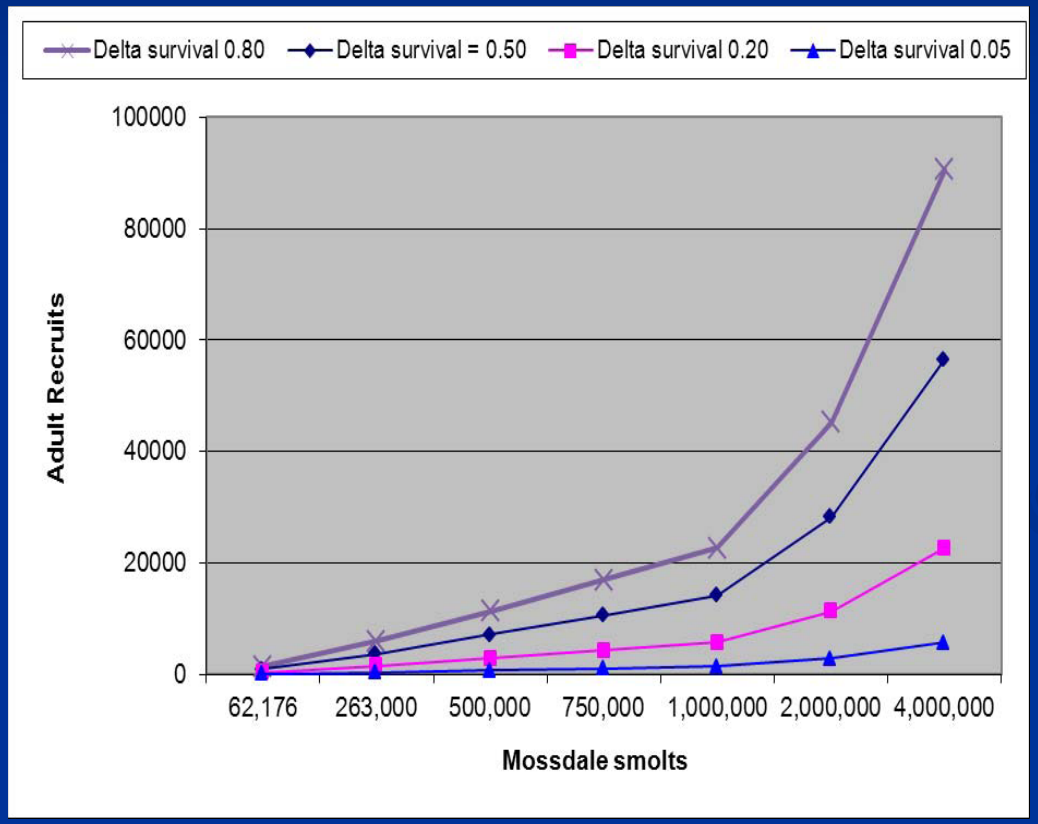
Source: SJRG, 2007 and SJRG, 2011

Key points

The Board should also consider :

7. the relationship between upstream juvenile production and simulated Delta survival to hypothetical adult recruitment in the San Joaquin basin

The simulated relationship between juvenile smolt production at Mossdale, Delta survival and adult recruits



In addition, DOI has previously provided information on:

* Simulations that indicate a 0.50 survival rate through the Delta could meet the doubling goal in 27 years.

* Estimates of flow levels needed at Vernalis to achieve doubling of Chinook production in the San Joaquin basin.

Source: DOI, 2011

Key points

The Board should also consider :

7. the relationship between upstream juvenile production and simulated Delta survival to hypothetical adult recruitment in the San Joaquin basin
8. the importance of continued survival monitoring, upstream and in the Delta

Key points

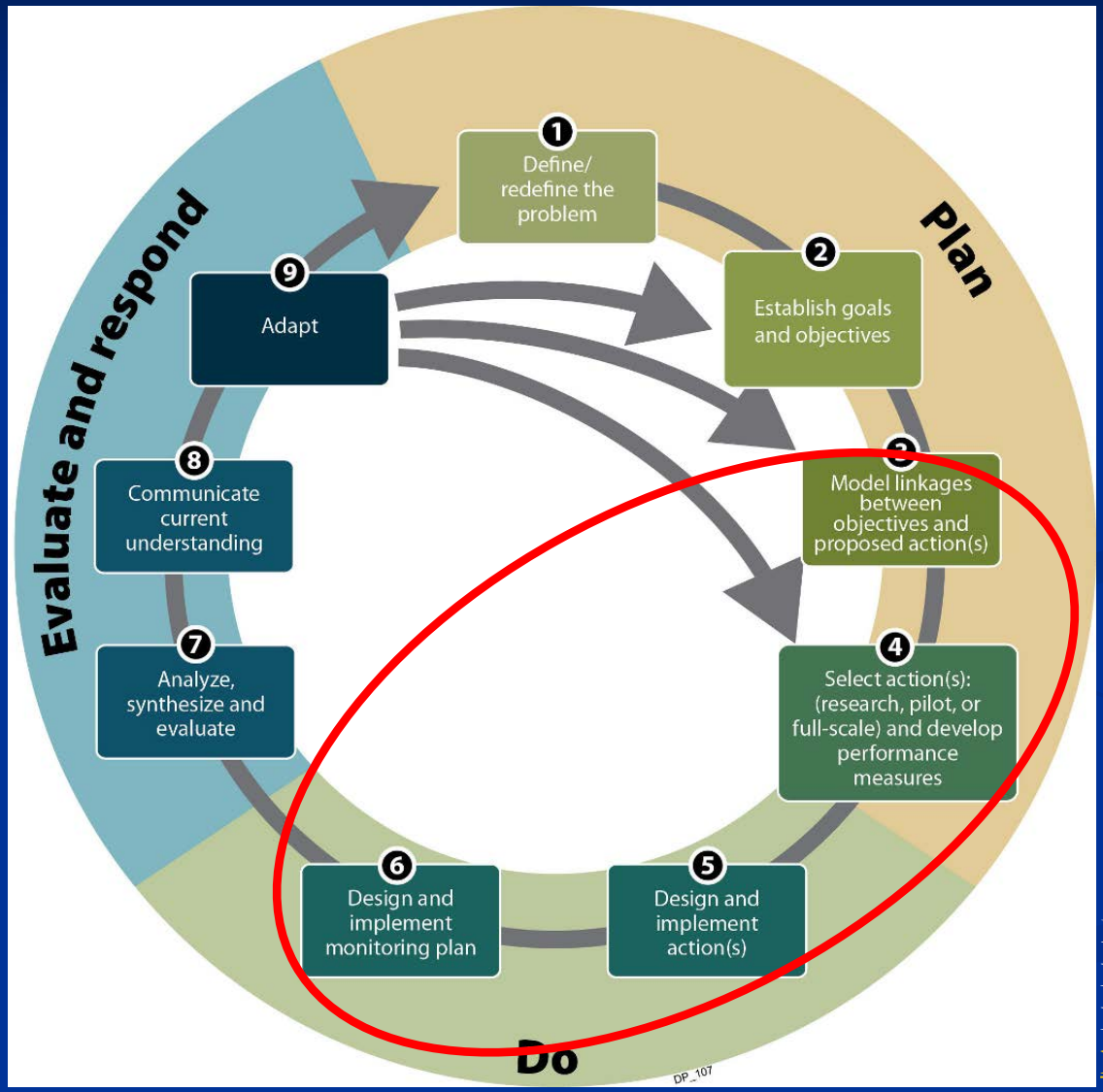
- The Board should address scientific uncertainty and changing circumstances

  - with an adaptive management plan (AMP)

  but consider a more protective approach while AMP development proceeds.

  * Although there is uncertainty, there is evidence that increased flows will benefit native fishes, including salmonids by increasing survival through the Delta (DOI, 2010).

Adaptive Management



Specific biological and physical indicators at multiple scales are needed for monitoring, refinement of models and for use in adaptive management

A range of flow criteria alternatives need to be identified for AM to ultimately achieve biological goals and objectives

DOI Technical and Application Guides may be helpful for implementing AM

From: DFG September 5, 2012 presentation: Delta Stewardship Council. 2012. Final Staff Draft of the Delta Plan. Available online: http://deltacouncil.ca.gov/delta-plan. Accessed 8/10/12.

Key points

*Increased flows that mimic the general seasonality, variability, magnitude and duration of the natural hydrograph will benefit native fishes including salmonids. (DOI, 2011)

* The Board should also consider flow objectives based upon a similar percent of unimpaired flow from each of the San Joaquin tributaries to meet the Vernalis objectives. (DOI, 2011)

SWRCB Workshop 2:
Bay-Delta Fishery Resources

NOAA Fisheries

October 1, 2012

Key points

1. **NMFS 2009 Biological Opinion (BiOp)**
   a) Jeopardy vs. Recovery
   b) Many areas, diversions and actions upstream are not covered
2. **The SWRCB should model a range of outflow objectives**
   a) Ensure they do not create unintended consequences upstream
3. **Increased flows will benefit native fishes, including salmonid survival through the Delta**
   a) Precautionary approach would support flows closer to the 2010 SWRCB flow criteria report.
4. **New or soon-to-be completed information is relevant**
   a) Adaptive management will be needed.
5. **Concerned about the continued decline and low numbers for winter-run Chinook**

NMFS 2009 BiOp and RPA Actions

Scope

a) **CVP/SWP controlled streams on the Sacramento and San Joaquin Rivers and their tributaries**

b) **Does not include actions that could also be taken by the many other non-federal entities in those watersheds.**

Significant areas not part of the scope of consultation:

a) **San Joaquin Tributaries Operations**
   i. Merced and Tuolumne river flows influence flows at Vernalis, but are not part of the Federal action addressed in the BiOp.

b) **Sacramento River Tributaries**
   i. The only independent populations of spring-run Chinook salmon, are in Butte, Mill, and Deer creeks, all of which are also not within the scope of the consultation.
   ii. Numerous upstream diversions are unscreened or operated by entities outside the scope of the CVP/SWP consultation

Post NMFS 2009 BiOp Information

<u>New information since 2009/2010:</u>

a) Annual Reviews, 2011 RPA amendments, Joint Stipulation

i. Examples of adaptive management

ii. Not aimed at recovery or addressing "uncovered" issues

b) NAS study (2010) - evaluated BiOps and RPAs

i. Overall RPA- "*The assortment of actions among the three habitat realms (watersheds, mainstem rivers, and delta) is designed to improve survival and to enhance connectivity throughout this system. This approach is consistent with the contemporary scientific consensus on improving ecosystem functioning…*" \

ii. OMR- "*The committee concludes that the strategy of limiting net tidal flows toward the pump facilities is sound, but …this action alone will [not] benefit the San Joaquin salmon, unless it is combined with an increase in San Joaquin River flows.*"

Dams and Cold Water Pool Management

- While restoring a natural hydrograph would benefit some species, it could adversely affect salmon and steelhead if not approached with care.

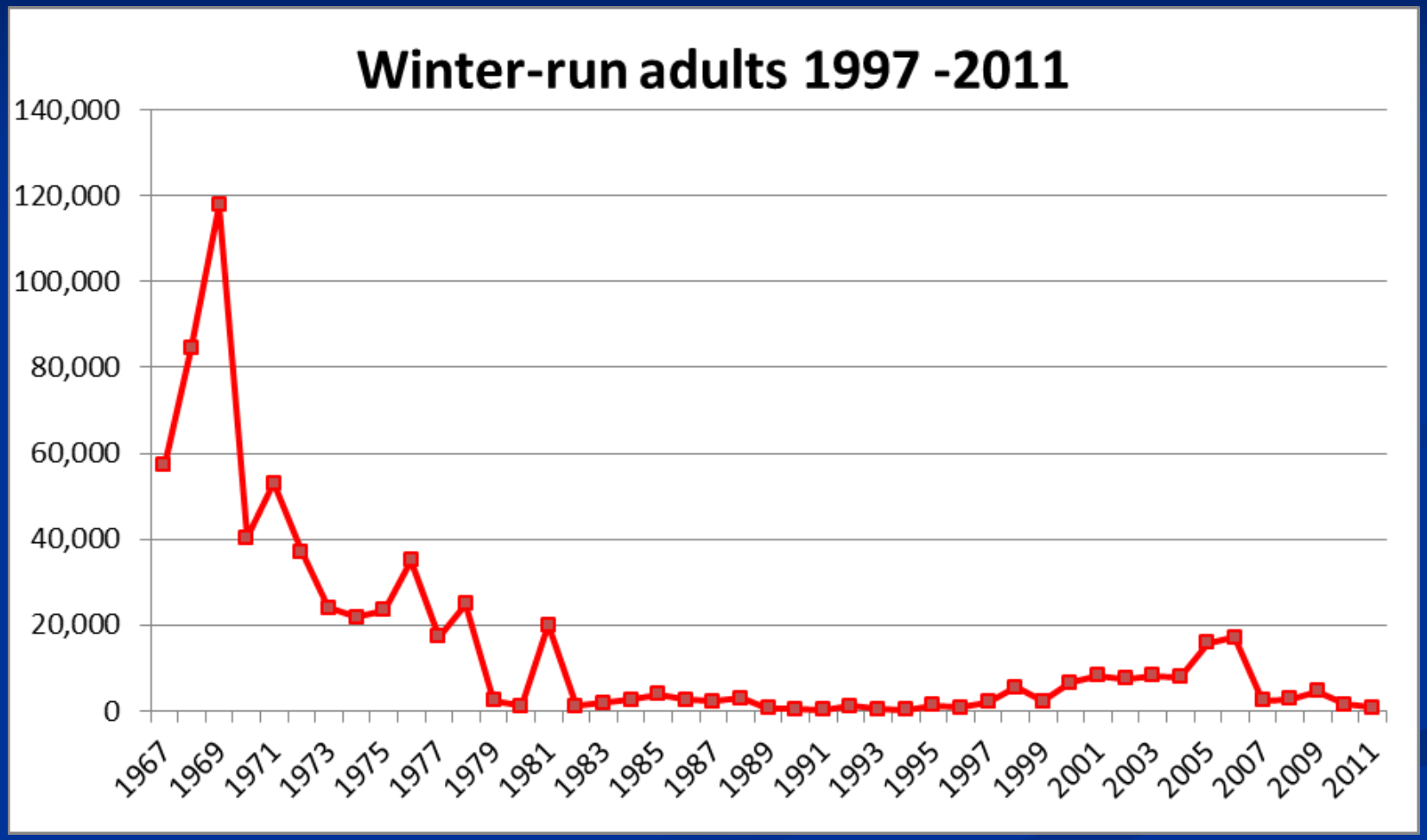
- Salmon and steelhead are precluded from accessing their historic spawning habitats by rim dams, and currently rely on carefully controlled reservoir releases for their survival.

- The SWRCB's process for establishing new outflow objectives should be accompanied by full CalSim modeling and evaluation.
  - Including potentially modifying SWRCB or DFG 2010 springtime outflow criteria to protect reservoir releases

Adaptive Management

- **The SWRCB is likely to face two kinds of uncertainty in the process of establishing Delta flow criteria:**
  (1) what flows each species requires for each life stage under different hydrological conditions, and
  (2) how current conditions will change over time and lead to changes in flow needs.
- **The SWRCB should use the precautionary approach and establish flow criteria that provide a margin of safety for fish populations dependent on the Delta**
- **Monitoring and adaptive management processes can be used to refine flows and incorporate new information.**

Winter-run Decline



Forthcoming Information

1. NMFS Final Recovery Plan (Winter 2012/2013)
2. Winter-Run Life Cycle Model (first stages: Dec. 2013)
3. Scientific paper on migration patterns of juvenile winter-run Chinook salmon through the Delta
   a) Co-authored by NMFS, FWS, DFG, DWR (in Press)
4. Report - Potential causes of 2011 winter-run decline
5. Technical memorandum for BDCP - Delta Salmonid Survival Objectives (early 2013)
   a) Co-authored by NMFS, FWS, DFG, DWR (in Press)

Suggestions for the SWRCB

1. **Upstream reservoir releases/ cold water pool management**
   a) Model a range of outflow objectives
   b) Modify 2010 SWRCB or DFG spring outflow criteria
2. **Consider and/or model alternative methods to protect beneficial uses of salmonids**
   a) Less unscreened diversions
   b) Decreased water use in rice decomposition
3. **Consider increased outflow in the San Joaquin to increase through Delta survival of salmonids**
   a) In addition to objective modifications suggested by FWS.
4. **Use the precautionary approach in face of uncertainty**
   a) Rely on adaptive management to address new information
5. **Support modifications to the DCC Gates objectives, in line with the comments of DFG.**

In conclusion

- **Adequate flows are an essential component of habitat for all life stages of listed and non-listed anadromous fish**
  a) **Both upstream in rivers and in the Delta.**

- **There continues to be strong support, even with new information, for the goals and biological objectives identified in the SWRCB 2010 flow criteria report.**

SWRCB Bay-Delta Fishery Resources workshop

U.S. Environmental Protection Agency

October 1, 2012

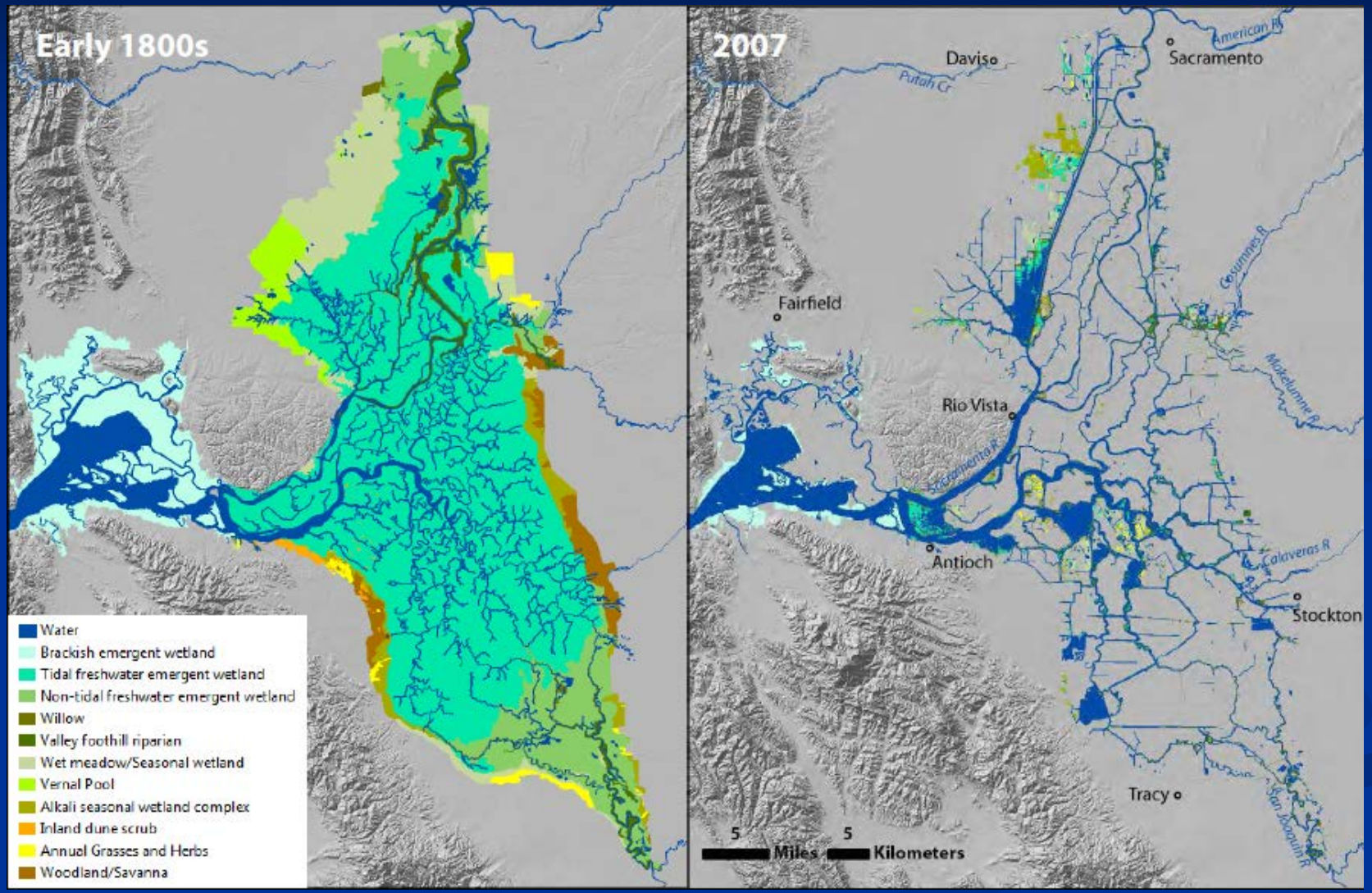
Outline

- EPA recommendations
- New Analyses
- Concepts for water quality objectives
- Important tools
- Adaptive management
- Recommendations

EPA Recommendations

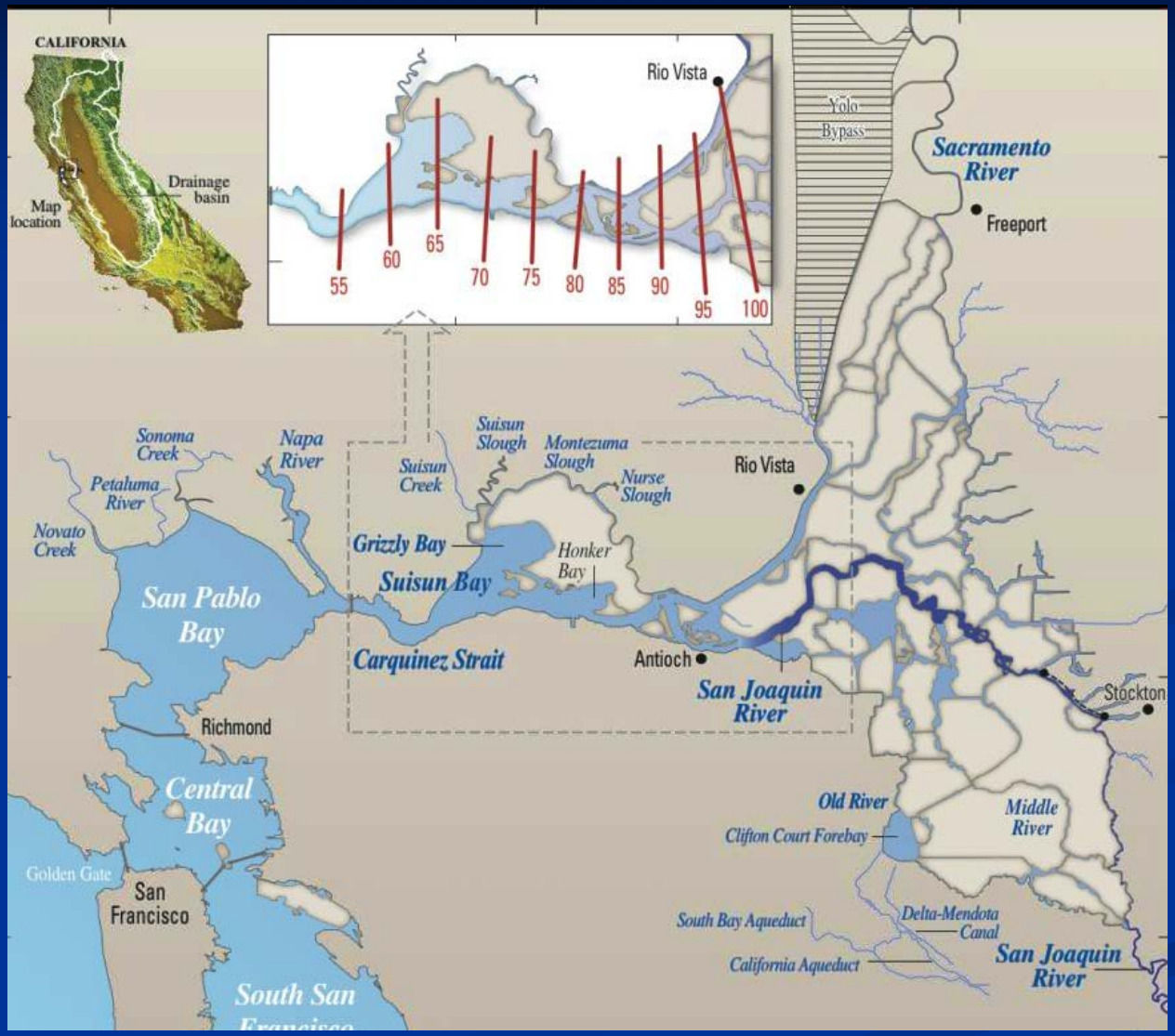
Objective	Recommendation
Springtime Delta outflow	• Begin in January or • Activate based on turbidity measure from first storm • Remove Roe Island trigger but require Roe Island standard • Operate reservoirs to maintain coldwater pool for salmonids
Fall Delta outflow	• Activate based on better estimate of real hydrologic conditions • Use 2010 flow criteria and reference conditions to identify objectives
San Joaquin Migratory Corridor	• Provide a fall hydraulic connection between Vernalis and the Bay

Geometry , habitat, and flows have changed



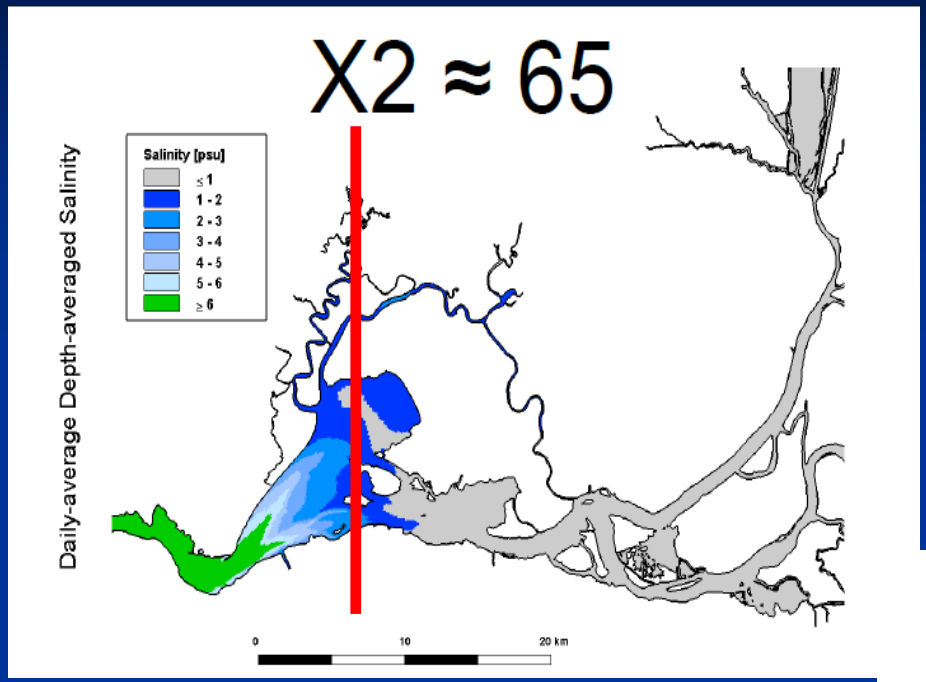
Source: SFEI 3/27/12 Presentation at LSZ Workshop available at http://www.epa.gov/sfbay-delta/pdfs/hist-estuarine-gradient-epa-grossinger.pdf

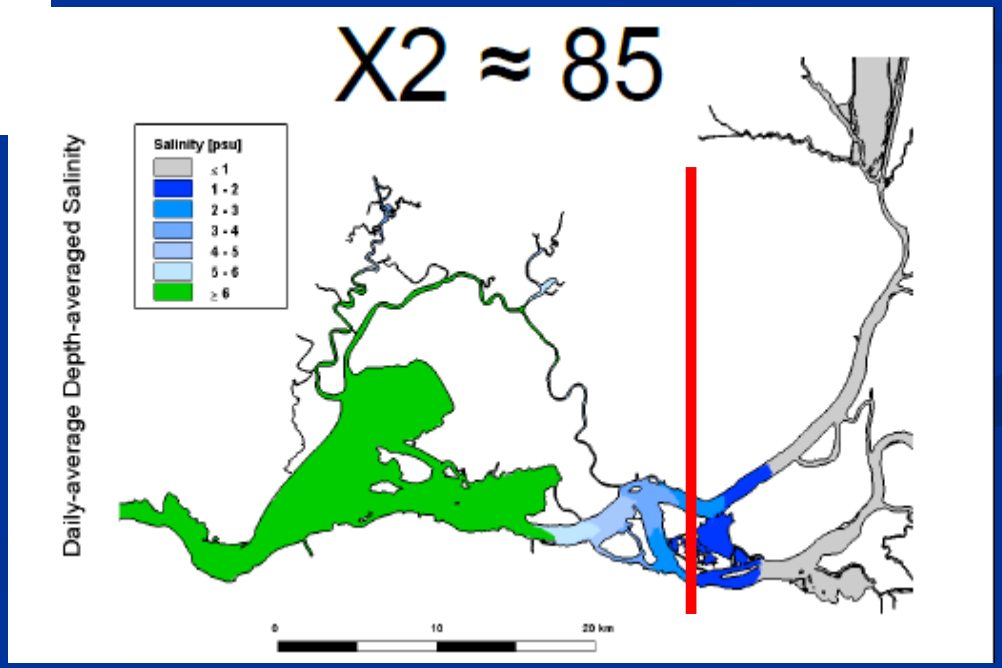
X2 and the SF Bay Delta Estuary



DeLio (2011) adapted from Jassby et al. (1995)

X2 and the Low Salinity Zone

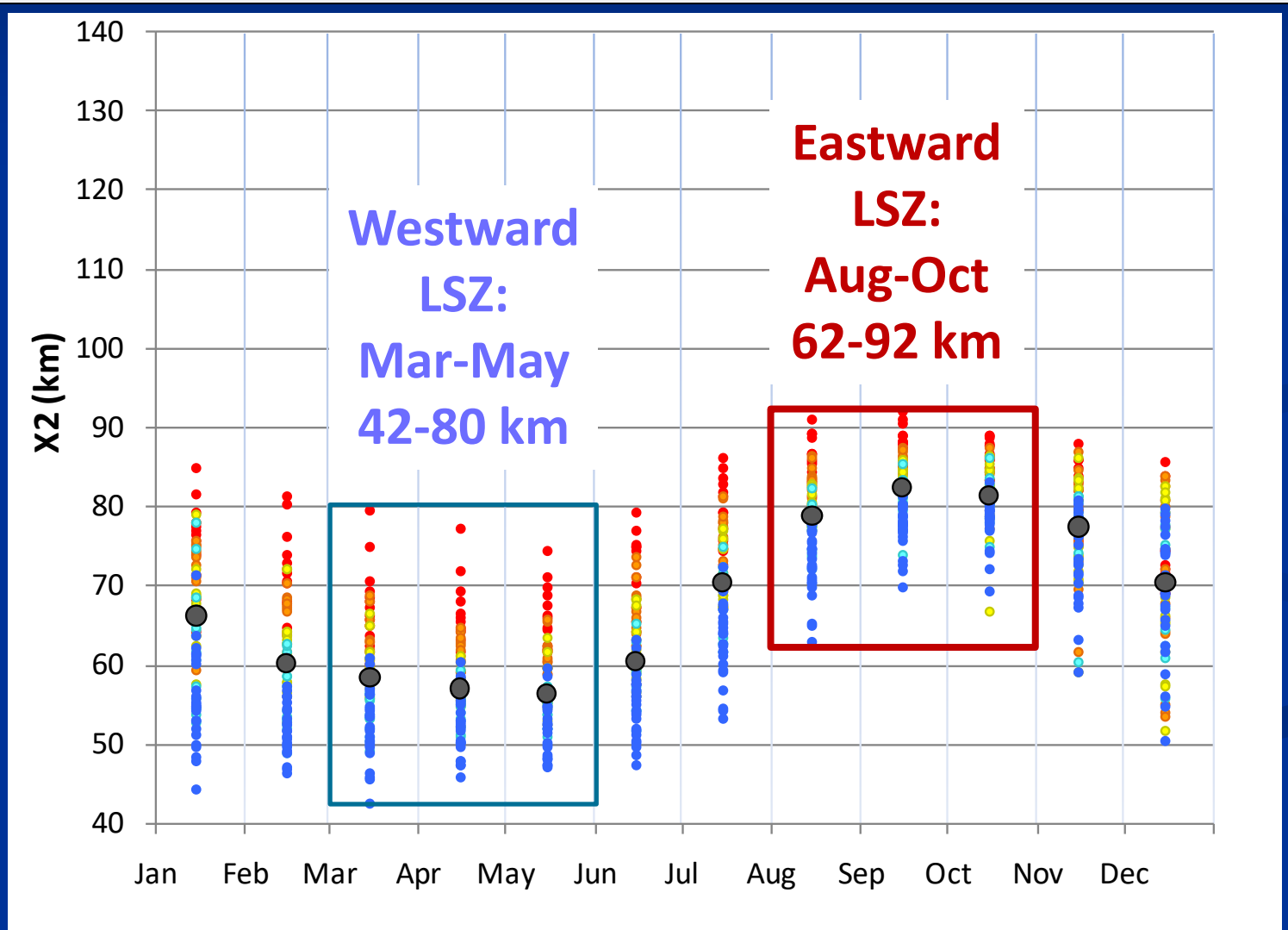




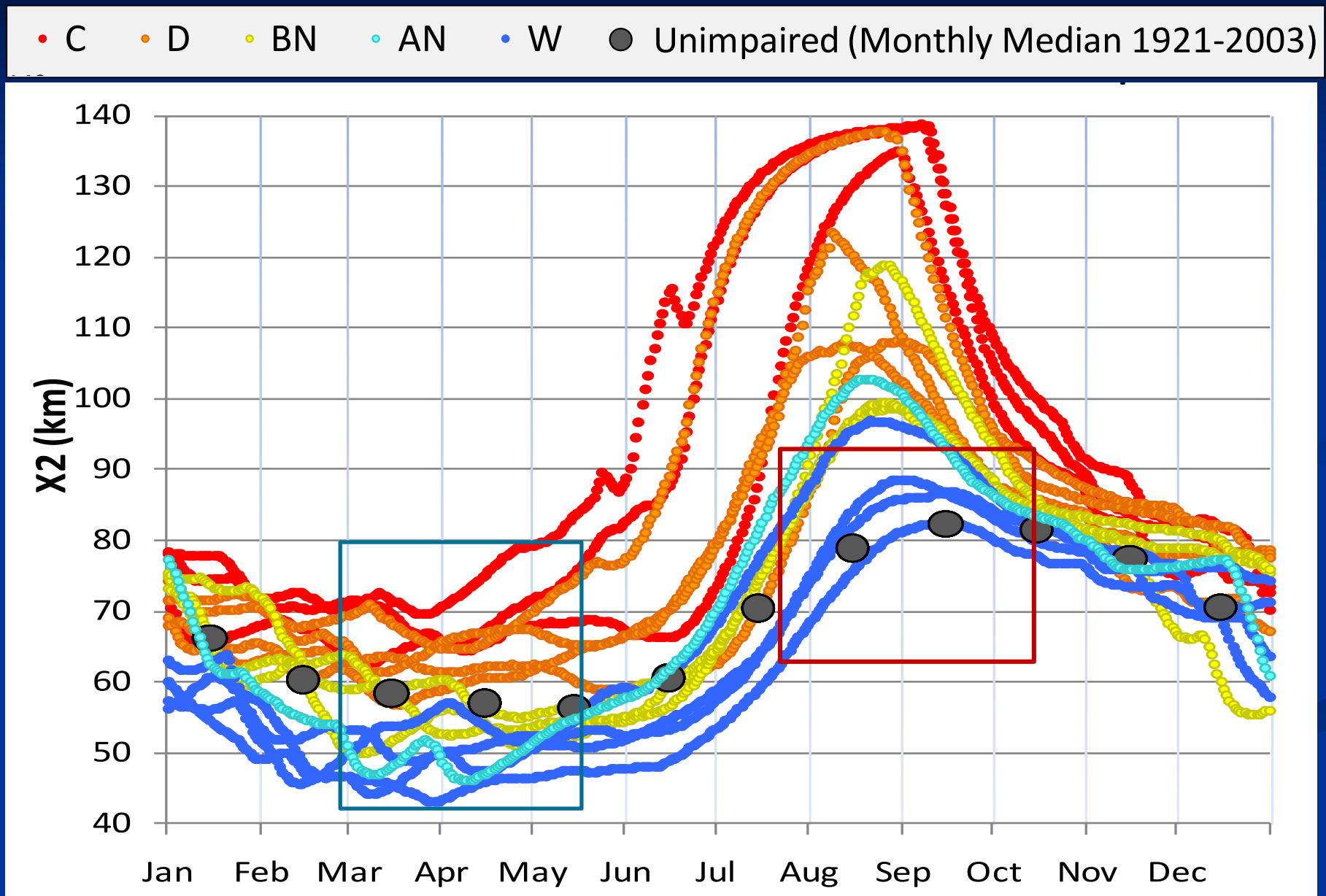
Source of X2 maps is Delta Modeling Associates Low Salinity Flip Book. June 15, 2012. Version 0.9.

Monthly Unimpaired X2 (km)

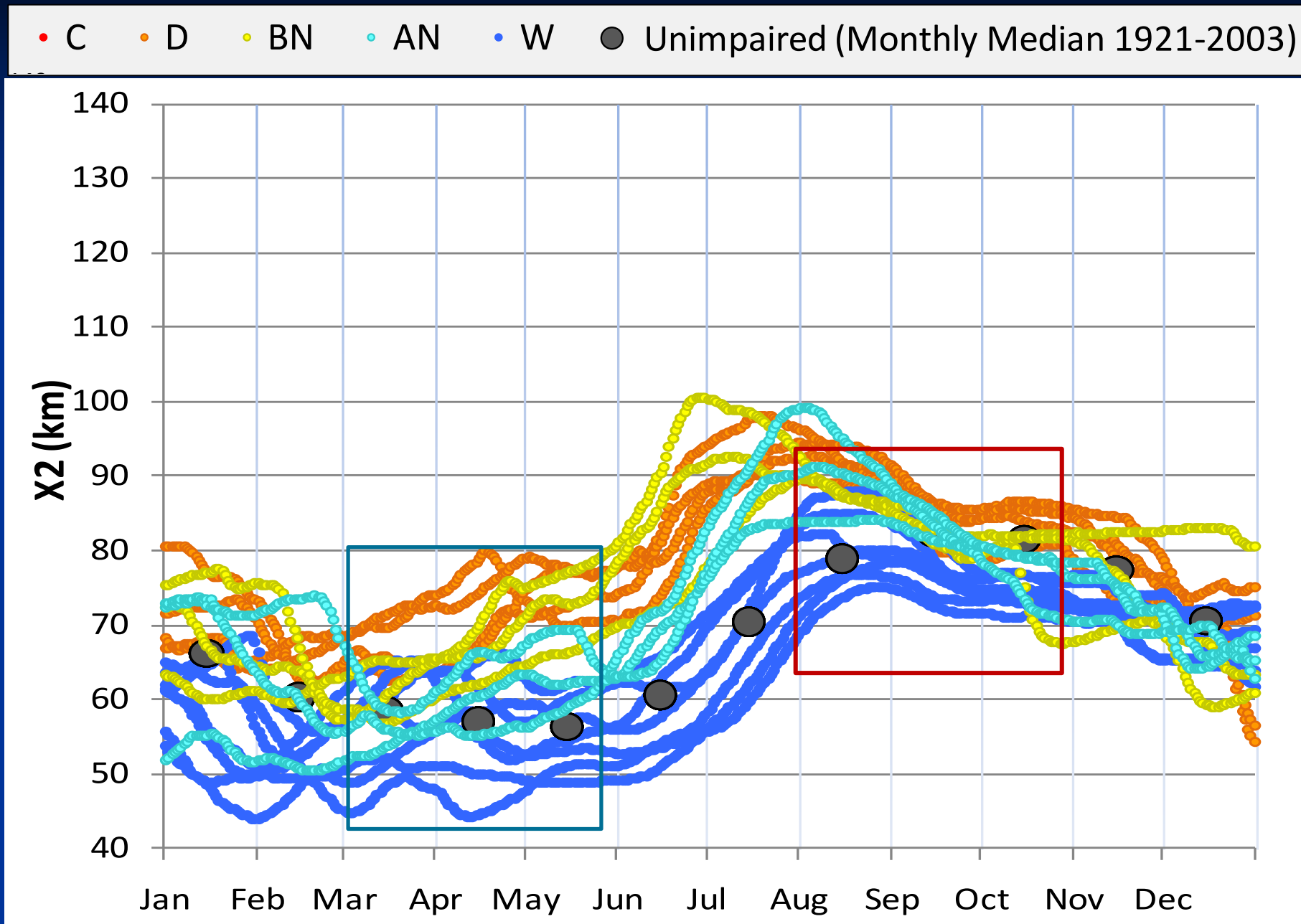
Courtesy of Dr. Anke Mueller-Solger, Using Jassby et al. 1995 Monthly Equation)



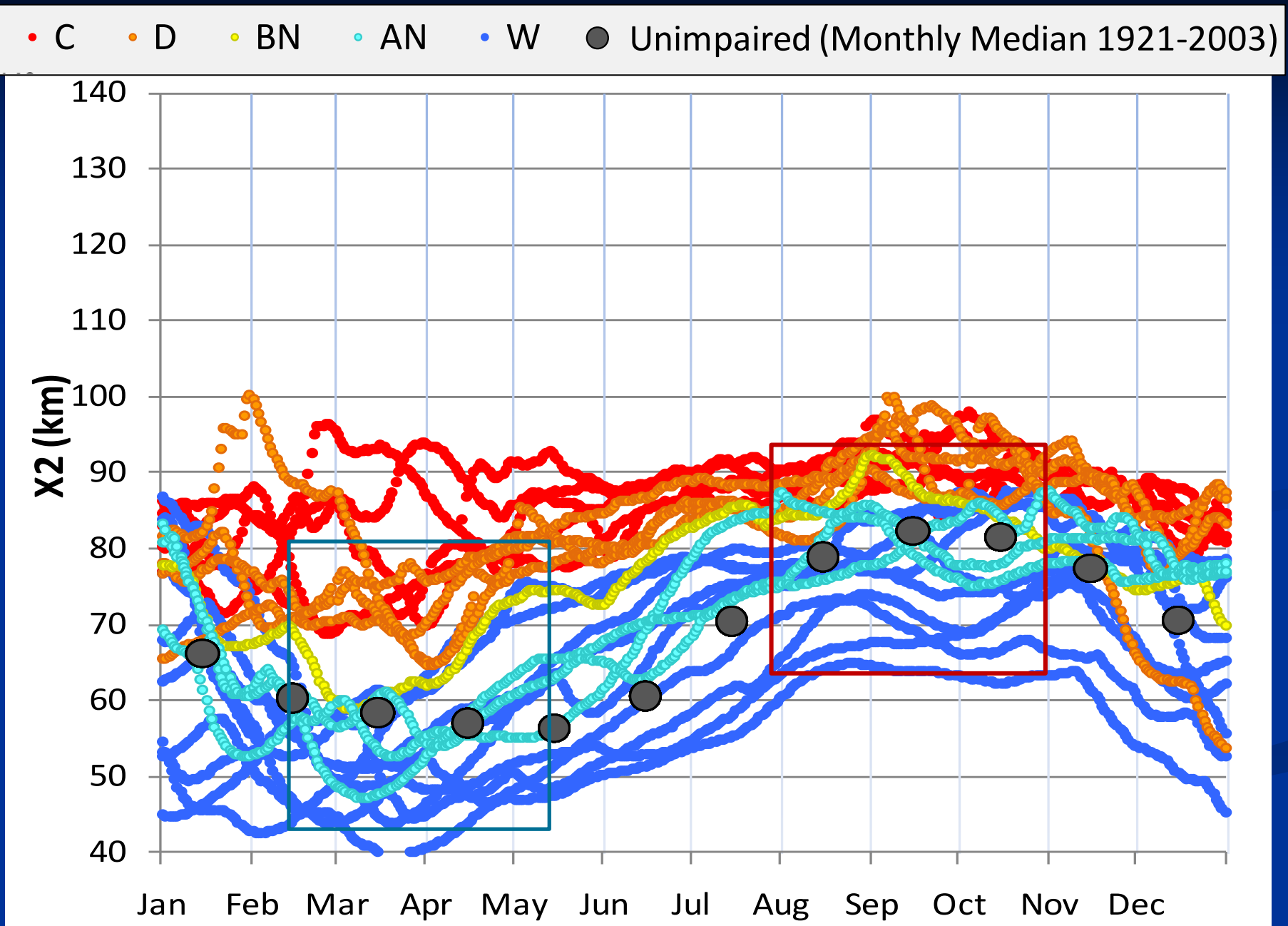
Daily X2 (km) Before Shasta Dam 1930-1944



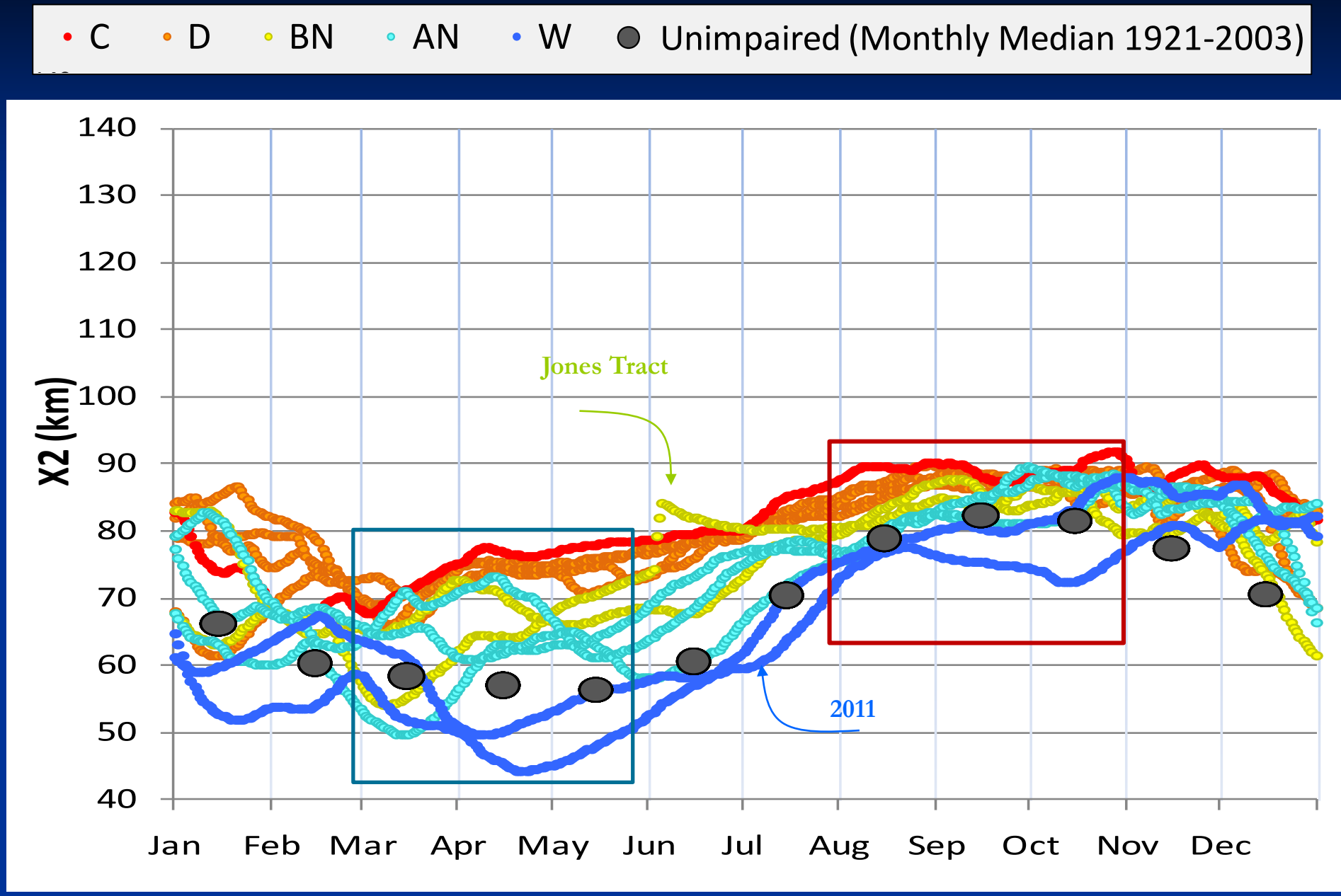
Daily **X2** (km) Before Exports 1951-1967



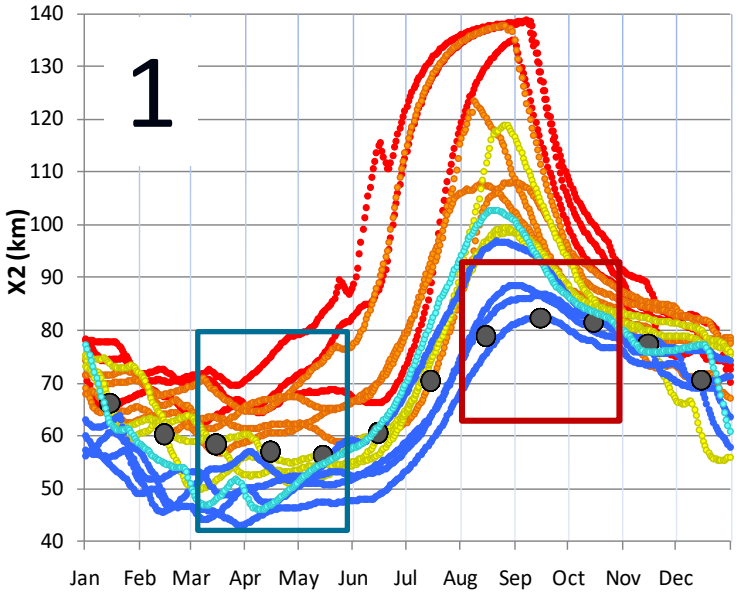
Daily X2 (km) Substantial Delta Diversions 1978-1999



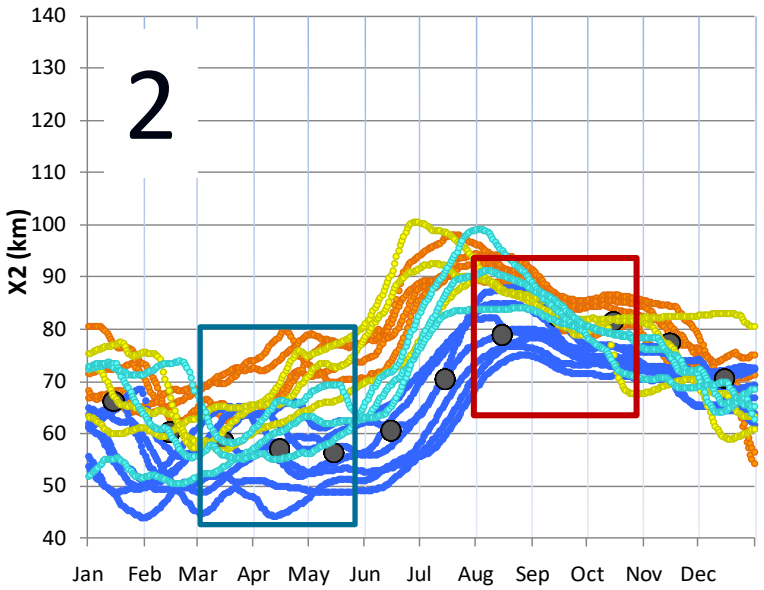
Daily X2 (km) After D-1641, 2000 and POD



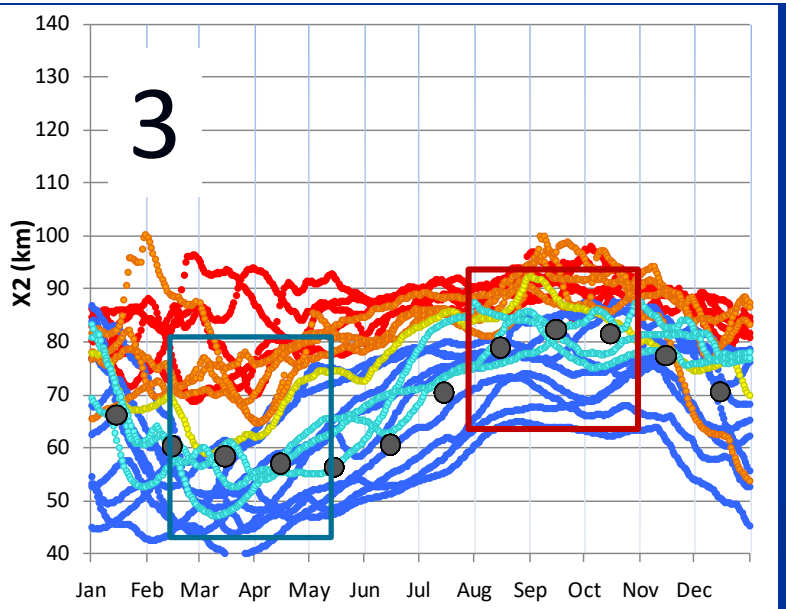
Before Shasta Dam (1930-1944)



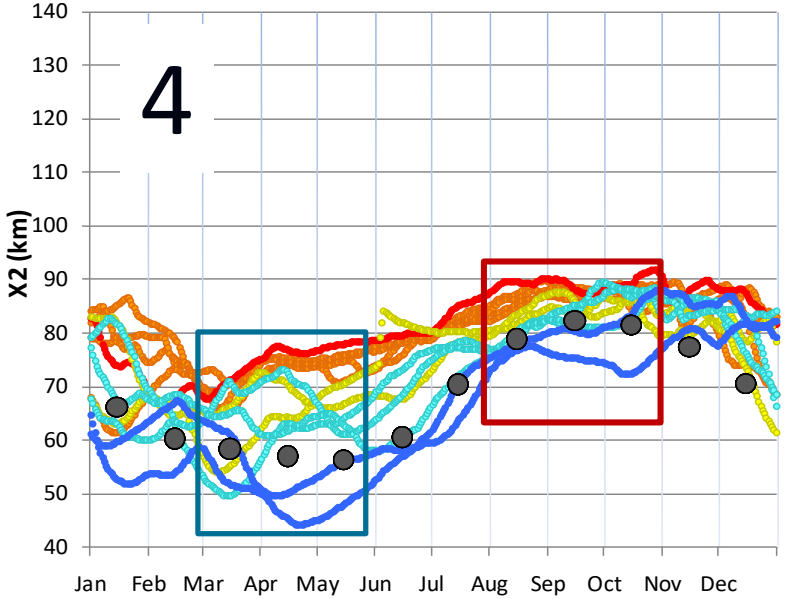
Before SWP Exports (1951-1967)



Substantial Delta Diversions (1978-1999)



After D-1641, 2000, & POD



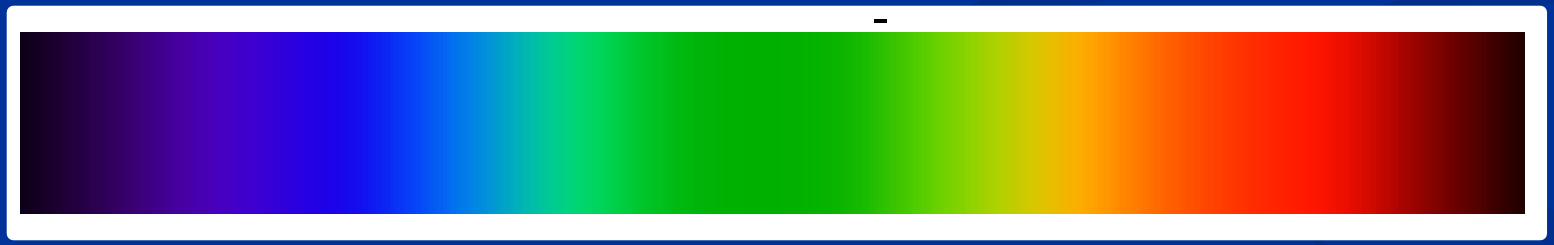
Concepts for changes to water quality objectives

- Delta outflow
- Sacramento inflow
- San Joaquin inflow
- Old and Middle River flows
- Floodplain flows

Evaluate a range of water quality objectives

More Aquatic Life Protection

Less Aquatic Life Protection



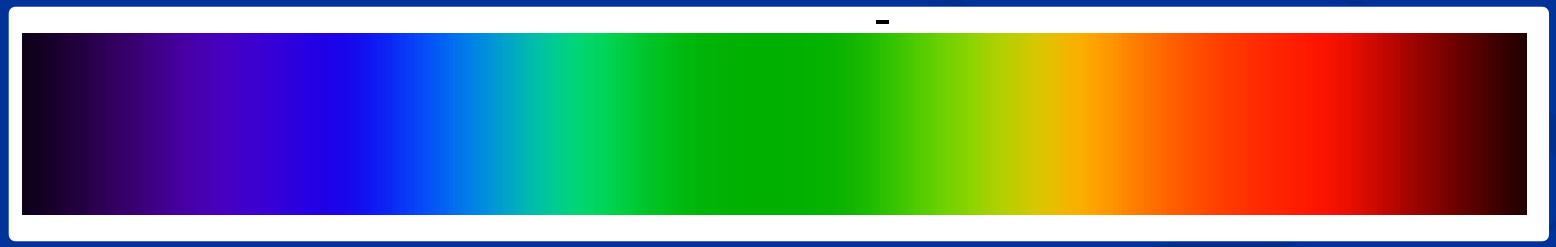
Evaluate a range of water quality objectives

Some of the
2010 Flow Criteria

2006 WQCP
+ ESA BOs

Alternative

Alternatives to evaluate



Concepts for changes to water quality objectives

Springtime Delta Outflow Modifications

- Extend into January or a reliable measure of first storm turbidity
- Require the Roe Island standard, but remove the trigger
- Maintain cold water pool in reservoirs

Concepts for changes to water quality objectives

Fall Delta Outflow Modifications

Activation

- 8-river index (April, May, June)
- End of June storage

Objective

- 2010 Flow Criteria Reports
- Reference condition

Concepts for changes to water quality objectives

San Joaquin Migratory Corridor

- Provide a hydraulic connection between Vernalis and the Bay
- Pulse flows in the fall (1:1 to 3:1 exports to inflow ratio) duration of 1 – 2 weeks

Adaptive Management

- Triennial review
- Controlled experiments
- Clearly defined boundaries
- Monitoring and data assessment

Summary

Recommendations

Objective	Recommendation	Agency
Springtime Delta outflow	• Begin in January or • Activate based on turbidity measure from first storm • Remove Roe Island trigger but require Roe Island standard • Operate reservoirs to maintain coldwater pool for salmonids • Specific X2 recommendations in Appendix 1 of workshop 2 comments (p. 2 – 4).	• EPA • EPA • EPA • EPA, NMFS • CDFG
Fall Delta outflow	• Activate based on better estimate of real hydrologic conditions • Use 2010 flow criteria and reference conditions to identify objectives • Specific X2 objectives recommended • OCAP Biological Opinion RPAs designed to avoid jeopardy of endangered species from operating CVP and SWP are not necessarily sufficient to support beneficial uses (phase II scoping comments)	• EPA • EPA • CDFG • NMFS, FWS
San Joaquin Migratory Corridor	• Provide a fall hydraulic connection between Vernalis and the Bay (spring addressed in Phase I)	• EPA
Delta Cross Channel	• Specific gate operation recommendations Table 1, page 16 of October 1, 2012 workshop comments, attachment 1.	• CDFG
Old and Middle River Flows	• Specific OMR flow recommendations from CDFG • OCAP Biological Opinion RPAs designed to avoid jeopardy of endangered species from operating CVP and SWP are not necessarily sufficient to support beneficial uses (phase II scoping comments)	• CDFG • NMFS, FWS